Freshline® food solutions
Modified Atmosphere
Packaging (MAP)
What is MAP?

MAP – which stands for Modified Atmosphere Packaging – is a type of food packaging which uses gases found in the air to keep food fresher for longer. It involves removing the air from the package and injecting either one or a mix of gases into food products at lower temperatures. At the forefront of this innovative process, Air Products’ Freshline® Solutions uses unrivalled technical expertise to provide products with optimum shelf life.

Who uses MAP?

Developed to meet the demands of a market driven by a growing consumer preference for fresh, pre-packed convenience foods, MAP is increasingly relied upon by many food processors for not only extended shelf life, but high product quality and improved presentation. As a result of MAP technology, many items of fresh food, from raw meat and fish, to prepared fruit and vegetables, ready-to-bake breads and pizzas, now come packed in their own modified atmosphere.

What are the benefits of MAP?

MAP offers many advantages to the food packaging industry, including the following:

- Extends shelf-life by 50-500%
- Allows centralised packaging and distribution, alleviating the need for in-store packaging
- Better utilisation of labour and equipment (flattening product peaks and allowing longer packing runs)
- Economies of scale (by purchasing larger quantities of raw materials)
- Enhancement of sales appeal (owing to attractive colour and presentation)
- Sealed packs prevent drip and odours throughout the distribution chain
- Minimises waste/spoilage
- Improved quality (slower deterioration)
- Reduced need for artificial preservatives
- Increased distribution possibilities

*Fact!*

Earth’s atmosphere consists of nitrogen (79%), Oxygen (20.96%), Carbon Dioxide (0.04%), traces of inert gases and water vapour. Changing this balance results in a modified atmosphere.

<table>
<thead>
<tr>
<th>Product</th>
<th>Temperature</th>
<th>Shelf-life</th>
</tr>
</thead>
<tbody>
<tr>
<td>raw red meat</td>
<td>−1°C to +2°C</td>
<td>5-8 days</td>
</tr>
<tr>
<td>raw poultry and game</td>
<td>−1°C to +2°C</td>
<td>10-21 days</td>
</tr>
<tr>
<td>poultry, dark portion and cuts</td>
<td>−1°C to +2°C</td>
<td>7-14 days</td>
</tr>
<tr>
<td>raw fish and seafood</td>
<td>−1°C to +2°C</td>
<td>4-6 days</td>
</tr>
<tr>
<td>cooked and cured meats</td>
<td>0°C to +3°C</td>
<td>4-8 months</td>
</tr>
<tr>
<td>cooked and cured fish and seafood</td>
<td>0°C to +3°C</td>
<td>7-21 days</td>
</tr>
<tr>
<td>cooked cured poultry and game</td>
<td>0°C to +3°C</td>
<td>7-21 days</td>
</tr>
<tr>
<td>ready meals</td>
<td>0°C to +3°C</td>
<td>5-10 days</td>
</tr>
<tr>
<td>combination products</td>
<td>0°C to +3°C</td>
<td>3-21 days</td>
</tr>
</tbody>
</table>
Components of the system

The MAP system comprises three key components - machinery, film and gases:

Machinery
Machinery used for MAP includes:
- Vacuum chambers
- Snorkel type
- Tray lidding
- Horizontal & vertical form-fill-seal
- Thermoform-fill-seal

Film
The choice of films used for MAP is largely determined by their gas and water vapour transmission rates.

Materials such as polyester (PET), nylon (PA), polyvinylidene chloride (PVdC) and ethylene vinyl alcohol copolymer (EVOH) provide good gas barriers, but in many cases poor water vapour barriers.

Gases
Pre-mixed Freshline® mixes or pure gases + mixer on site.

Gas supply modes
- **Cylinders**
  - Pre-mixed or pure products
  - Supplied individually or in packs
- **Micro Bulk**
  - Small tank trucks and on-site storage containers
- **Bulk**
  - Bulk liquid gas supplied to a static tank on site which is regularly refilled
- **Onsite Gas Generators**
  - Sited within production facility with a dedicated pipe to points of use

Modes of gas supply

Types of packaging machines
- Vacuum chamber (VC)
- Thermoform-fill-seal (TFFS)
- Horizontal form-fill-seal (HFFS)

Two cylinder packs
Cylinders
CryoEase
Tanks
Gasmixer
Vacuum
infeed
chamber
and heat
sealing unit
Food product in bag
Gas flow

Out feed
Tray lidding
Trays loaded with food

Out feed of Modified Atmosphere Packs
Trays loaded with food
Base web to form tray

Flexible packaging film infeed

Folding box
Cutting jaws
Flexible MA pillow-pack

Food product
Gas lance
Heat sealing jaws
### Gas Properties

<table>
<thead>
<tr>
<th>Gas</th>
<th>Properties</th>
</tr>
</thead>
</table>
| **CO₂** | Inhibits growth of most aerobic bacteria and moulds  
Higher CO₂ = longer achievable shelf-life  
CO₂ readily absorbed into high-moisture/fatty foods  
Excess levels of CO₂ can cause:  
– Tainted flavour  
– Drip loss  
– Pack collapse  
To control bacterial and mould growth, minimum 20% recommended |
| **Nitrogen** | Inert gas used to exclude air and oxygen  
Used as a balance gas (filler) to prevent pack collapse in foods which absorb CO₂  
Used in snacks and dried products (100%) to prevent oxidative rancidity |
| **Oxygen** | Causes oxidative deterioration of foods  
Required for growth of aerobic micro-organisms  
Generally O₂ should be excluded  
However, can be used as follows:  
– Maintain fresh, natural colour (redmeats)  
– Maintain respiration (fruit & veg) |

*Fact!*  
Oxygen should not be used in concentrations over 21% unless the packaging machinery is compatible.  
A guideline document “The safe application of oxygen enriched atmospheres and packaging foods” (BCGA 1998) is available.

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### For more information

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<th>UK</th>
<th>Ireland</th>
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